Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method for producing a model ~~of a combination of a plurality of systems~~, the method comprising:

~~representing each of said plurality of systems as~~ selecting an application mode modeling physical quantities ~~of said each system~~ for one or more of a plurality of systems in an apparatus;

receiving an input of one or more physical properties for each of the selected application modes;

determining a representation of a set of one or more partial differential ~~equation system~~ equations for each application mode corresponding to one of said plurality of systems using at least one non-local coupling and said one or more input physical properties, said at least one non-local coupling defining a value from a first portion of a first domain to another part of a second domain; and

producing a model of the combination of said plurality of systems for said apparatus by forming ~~said~~ a combined ~~system of~~ set of one or more partial differential equations using said determined sets of partial differential ~~equation system~~ equations associated with said plurality of systems.

2. (Currently Amended) The method of claim 1, wherein at least one of said determined sets of partial differential equation ~~systems~~ uses at least one local coupling.

3. (Original) The method of claim 1, wherein said first and second domain are the same.

4. (Original) The method of claim 1, wherein said first and second domain are different.

5. (Original) The method of claim 1, further comprising: defining a non-local coupling wherein a value of a quantity on a boundary of said first domain are referenced in defining parallel lines extending into the domain.

6. (Original) The method of claim 1, further comprising: defining a non-local coupling in which a boundary condition associated with said first domain is defined using a value of an integral over a portion of one of: said first domain and said second domain.

7. (Original) The method of claim 1, further comprising: defining a non-local coupling using at least one of: a mapped variable and an integrated variable.

8. (Original) The method of claim 2, further comprising: defining a local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

9. (Original) The method of claim 1, further comprising: defining a non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

10. (Currently Amended) The method of claim 1, further comprising: determining a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein said combined ~~system~~ set of partial differential equations is in weak form, said stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom; determining said residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein said combined ~~system~~ set of partial differential equations is in weak form.

11. (Currently Amended) The method of claim 10, further comprising: converting said combined ~~system~~ set of partial differential equations from general form to weak form.

12. (Original) The method of claim 11, wherein said determining said stiffness matrix further comprises: determining values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

13. (Original) The method of claim 12, wherein said determining said residual vector further comprises: determining values of variables and a Jacobian of said variables for node points and for other points in accordance with coupling variables.

14. (Currently Amended) A computer readable medium having stored thereon instructions for producing a model ~~of a combination of a plurality of systems~~

comprising machine executable code for which when executed by at least one processor, causes the processor to perform steps comprising:

~~representing each of said plurality of systems as~~ selecting an application mode modeling physical quantities ~~of said each system~~ for one or more of a plurality of systems in an apparatus;

receiving an input of one or more physical properties for each of the application modes;

determining a representation of a set of one or more partial differential ~~equation system~~ equations for each application mode corresponding to one of said plurality of systems using at least one non-local coupling and said one or more input physical properties, said at least one non-local coupling defining a value from a first portion of a first domain to another part of a second domain; and

producing a model of the combination of said plurality of systems for said apparatus by forming ~~said~~ a combined ~~system of~~ set of one or more partial differential equations using said determined sets of partial differential ~~equation system~~ equations associated with said plurality of systems.

15. (Currently Amended) The computer readable medium of claim 14, wherein at least one of said determined sets of partial differential equation ~~systems~~ uses at least one local coupling.

16. (Previously Presented) The computer readable medium of claim 14, wherein said first and second domain are the same.

17. (Previously Presented) The computer readable medium of claim 14, wherein said first and second domain are different.

18. (Previously Presented) The computer readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling wherein a value of a quantity on a boundary of said first domain are referenced in defining parallel lines extending into the domain.

19. (Previously Presented) The computer readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling in which a

boundary condition associated with said first domain is defined using a value of an integral over a portion of one of: said first domain and said second domain.

20. (Previously Presented) The computer readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling using at least one of: a mapped variable and an integrated variable.

21. (Previously Presented) The computer readable medium of claim 15, further comprising machine executable code for: defining a local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

22. (Previously Presented) The computer readable medium of claim 14, further comprising machine executable code for: defining a non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

23. (Currently Amended) The computer readable medium of claim 14, further comprising machine executable code for: determining a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein said combined ~~system~~ set of partial differential equations is in weak form, said stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom; determining said residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein said combined ~~system~~ set of partial differential equations is in weak form.

24. (Currently Amended) The computer readable medium of claim 23, further comprising machine executable code for: converting said combined ~~system~~ set of partial differential equations from general form to weak form.

25. (Previously Presented) The computer readable medium of claim 24, wherein said machine executable code for determining said stiffness matrix further comprises: machine executable code for determining values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

26. (Previously Presented) The computer readable medium of claim 25, wherein said machine executable code for determining said residual vector further comprises machine executable code for: determining values of variables and a Jacobian of said variables for node points and for other points in accordance with coupling variables.

27. (Currently Amended) ~~A system~~ An apparatus for producing a model ~~of a combination of a plurality of systems~~, the ~~system~~ apparatus comprising:

a ~~representation~~ selection system in at least one computing device that selects ~~represents each of said plurality of systems as~~ an application mode modeling physical quantities ~~of said each system~~ for one or more of a plurality of systems in an apparatus;

an interface system receives an input of one or more physical properties for each of the application modes;

a determination system in the at least one computing device that determines a representation of a set of one or more partial differential ~~equation system~~ equations for each application mode corresponding to one of said plurality of systems using at least one non-local coupling and said one or more input physical properties defining a value from a first portion of a first domain to another part of a second domain; and

an output system in the at least one computing device that produces a model of the combination of said plurality of systems for said apparatus by forming said combined ~~system of~~ set of one or more partial differential equations using said determined sets of partial differential ~~equation systems~~ equations associated with said plurality of systems.

28. (Currently Amended) The ~~system~~ apparatus of claim 27, wherein at least one of said determined sets of partial differential equation ~~systems~~ uses at least one local coupling.

29. (Currently Amended) The ~~system~~ apparatus of claim 27, wherein said first and second domain are the same.

30. (Currently Amended) The ~~system~~ apparatus of claim 27, wherein said first and second domain are different.

31. (Currently Amended) The ~~system~~ apparatus of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling wherein a value of a quantity on a boundary of said first domain are referenced in defining parallel lines extending into the domain.

32. (Currently Amended) The ~~system~~ apparatus of claim 27, further comprising a definition system in the at least one computing device that defines a non-local

coupling in which a boundary condition associated with said first domain is defined using a value of an integral over a portion of one of: said first domain and said second domain.

33. (Currently Amended) The ~~system~~ apparatus of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling using at least one of: a mapped variable and an integrated variable.

34. (Currently Amended) The ~~system~~ apparatus of claim 28, further comprising a definition system in the at least one computing device that defines a local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

35. (Currently Amended) The ~~system~~ apparatus of claim 27, further comprising a definition system in the at least one computing device that defines a non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

36. (Currently Amended) The ~~system~~ apparatus of claim 27, further comprising another determination system in the at least one coupling device that determines a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein said combined ~~system~~ set of partial differential equations is in weak form, said stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom and that determines said residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein said combined ~~system~~ set of partial differential equations is in weak form.

37. (Currently Amended) The ~~system~~ apparatus of claim 36, further comprising a conversion system in the at least one computing device that converts said combined ~~system~~ set of partial differential equations from general form to weak form.

38. (Currently Amended) The ~~system~~ apparatus of claim 37, wherein the another determination system determines values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

39. (Currently Amended) The ~~system~~ apparatus of claim 38, wherein the another determination system determines values of variables and a Jacobian of said variables for node points and for other points in accordance with coupling variables.

40. (New) The method as set forth in claim 1 further comprising receiving an input of one or more boundary conditions for each of the application modes, wherein the determining a representation of a set of one or more partial equations for each application mode corresponding to one of said plurality of systems also uses said one or more input boundary conditions.

41. (New) The computer readable medium as set forth in claim 14 further comprising receiving an input of one or more boundary conditions for each of the application modes, wherein the determining a representation of a set of one or more partial equations for each application mode corresponding to one of said plurality of systems also uses said one or more input boundary conditions.

42. (New) The system as set forth in claim 27 wherein the interface system receives an input of one or more boundary conditions for each of the application modes and wherein the determination system that determines the representation of the set of one or more partial equations for each application mode corresponding to one of said plurality of systems also uses said one or more input boundary conditions.

43. (New) An apparatus for producing a model, the apparatus comprising:

means for selecting an application mode modeling physical quantities for one or more of a plurality of systems in an apparatus;

means for receiving an input of one or more physical properties for each of the application modes;

means for determining a representation of a set of one or more partial differential equations for each application mode corresponding to one of the plurality of systems using at least one non-local coupling and the one or more input physical properties, the at least one non-local coupling defining a value from a first portion of a first domain to another part of a second domain; and

means for producing a model of the combination of the plurality of systems for the apparatus by forming a combined set of one or more partial differential equations using the determined sets of partial differential equations associated with the plurality of systems.

44. (New) The apparatus of claim 43, wherein at least one of the determined sets of partial differential equation uses at least one local coupling.

45. (New) The apparatus of claim 43, wherein the first and second domain are the same.

46. (New) The apparatus of claim 43, wherein the first and second domain are different.

47. (New) The apparatus of claim 43, further comprising means for defining a non-local coupling wherein a value of a quantity on a boundary of the first domain are referenced in defining parallel lines extending into the domain.

48. (New) The apparatus of claim 43, further comprising means for defining a non-local coupling in which a boundary condition associated with the first domain is defined using a value of an integral over a portion of one of: the first domain and the second domain.

49. (New) The apparatus of claim 43, further comprising: defining a non-local coupling using at least one of: a mapped variable and an integrated variable.

50. (New) The apparatus of claim 44, further comprising: defining the local coupling using at least one of: a basic variable, an expression variable, and a glued variable.

51. (New) The apparatus of claim 44, further comprising: defining the non-local coupling variable using at least one of: an extrusion variable, a projection variable and a scalar variable.

52. (New) The apparatus of claim 43, further comprising:

means for determining a stiffness matrix by determining a Jacobian of each variable in accordance with each type of variable wherein the combined set of partial differential equations is in weak form, the stiffness matrix being a Jacobian matrix formed from a residual vector with respect to a number of degrees of freedom; and

means for determining the residual vector by determining a Jacobian of each variable in accordance with each type of variable wherein the combined set of partial differential equations is in weak form.

53. (New) The apparatus of claim 52, further comprising means for converting the combined set of partial differential equations from general form to weak form.

54. (New) The apparatus of claim 53, wherein the determining the stiffness matrix further comprises: determining values of a Jacobian of variables in accordance with points included in a quadrature formula and with other points in accordance coupling variables.

55. (New) The apparatus of claim 54, wherein the means for determining the residual vector further comprises means for determining values of variables and a Jacobian of the variables for node points and for other points in accordance with coupling variables.

56. (New) The apparatus as set forth in claim 43 wherein the means for receiving further comprises means for receiving an input of one or more boundary conditions for each of the application modes, wherein the means for determining a representation of a set of one or more partial equations for each application mode corresponding to one of the plurality of systems also uses the one or more input boundary conditions.